



Dryden Flight Research Center  
P. O. Box 273  
Edwards, California 93523-0273

DCP-S-027  
Baseline  
March 2, 1999

---

# **DRYDEN CENTERWIDE PROCEDURE**

## **CODE SH**

# **SHOP SAFETY**

Electronically Approved by:  
Associate Director

Approved by:  
Acting Director, Safety and Mission Assurance

Approved by:  
Chief, Safety, Health, and Environmental Office

ALL DOCUMENTS ON THIS SITE  
<http://www.dfrc.nasa.gov/DMS/dms.html>  
ARE FOR REFERENCE ONLY  
THIS SITE IS UPDATED EVERY 30 DAYS

DOCUMENT HISTORY LOG

Status	Document Revision	Effective Date	Description
Baseline		March 2, 1999	

## CONTENTS

	Page
1.0 INTRODUCTION	
1.1 Purpose .....	4
1.2 Applicability .....	4
1.3 Scope .....	4
2.0 REFERENCE	
2.1 General .....	4
2.2 Authority Documents .....	4
2.3 Guideline Documents .....	5
3.0 ROLES and RESPONSIBILITIES	
3.1 Overview .....	5
3.2 Directorates and Single Letter Offices .....	5
3.3 Safety, Health, and Environmental Office ...	5
3.4 Shop Supervisors .....	6
3.5 Employees .....	6
4.0 BASIC SHOP SAFETY RULES	
4.1 General Shop Rules .....	7
5.0 HAND and PORTABLE POWERED TOOLS	
5.1 Hand Tool Safety Rules .....	9
5.2 Portable Power Tools Safety .....	10
5.3 Safety Switches .....	12
5.4 Jacks .....	12
5.5 Ladders .....	13
6.0 MACHINERY and MACHINE GUARDING	
6.1 General Machine Guarding Requirements For All Machines .....	14
6.2 Specific Machine Guarding Requirements....	15
7.0 UNFIRED PRESSURE VESSELS .....	15

## 8.0 WELDING

8.1	Welding, Cutting, and Brazing Permits .....	15
8.2	Welding Safety .....	15
8.3	Welding Health Hazards .....	16
8.4	Physical Hazards .....	16

## 9.0 CARPENTRY

9.1	General Carpentry Rules .....	17
9.2	Carpentry Tools .....	17

## 10.0 PLUMBING

10.1	General Plumbing Rules .....	17
------	------------------------------	----

## 11.0 PAINTING

11.1	General Painting Rules .....	18
------	------------------------------	----

## 12.0 VENTILATION

12.1	Ventilation Requirements .....	19
12.2	Ventilation Systems .....	19

## 13.0 PERSONAL SAFETY

13.1	Reduced Ability .....	19
13.2	Medication .....	19
13.3	Intoxicants .....	20
13.4	Hygiene .....	20

## 14.0 PERSONAL PROTECTIVE EQUIPMENT

14.1	Protective Headwear .....	20
14.2	Eye Protection .....	20
14.3	Hearing Protection .....	21
14.4	Respiratory Protection .....	21
14.5	Safety Footwear .....	22

## 15.0 TRAINING

15.1	Training Requirements .....	22
15.2	Training Records .....	22

## 1.0 INTRODUCTION

### 1.1 Purpose

This Dryden Center-wide Procedure (DCP-S-027) establishes basic safety procedures and provides guidance for safe shop operations at DFRC.

### 1.2 Applicability

DCP-S-027 applies to government and non-government personnel at DFRC and at DFRC controlled off-site locations.

### 1.3 Scope

DCP-S-027 establishes basic safety procedures and defines responsibilities to control and protect government and non-government employees and resources when working in or near shop equipment, however, because of the complex and unique tasks assigned to shops this DCP can not elaborate on every task. It is essential, therefore, that supervisors assume the responsibility to ensure that shop personnel follow codes, standards, and procedures that govern specific shop activities.

## 2.0 REFERENCE

### 2.1 General

Shop safety instructions are obtained from directives which address various activities that occur within shops. If safety instructions for a task that has a risk potential cannot be found in current directives the Shop Supervisor will conduct a safety analysis and write procedures for the task.

### 2.2 Authority Documents

2.2.1 NPD 87102B: NASA Safety and Health Program Policy. This NPD establishes the requirements for the NASA wide safety and health program and is the authority for this DCP.

2.2.2 29 CFR 1910: "Labor" and 29 CFR 1926, "Construction". These Codes of Federal Regulations contain specific safety procedures, by subject, that must be followed to ensure a safe shop.

2.2.3 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response. This standard sets policy for clean-up and emergency response operations for organizations that use or store hazardous materials.

2.2.4 Equipment manufacturer's instructions and recommendations.

### 2.3 Guideline Documents

There are numerous documents that cover specific topics pertaining to shop operations. Some of these documents, or portions thereof, become authoritative when incorporated by reference by 29 CFR 1910.6. Examples of shop procedures incorporated by reference may be found in the following documents.

2.3.1 American National Standards Institute (ANSI).

2.3.2 National Fire Protection Association (NFPA) codes.

2.3.3 American Conference of Governmental Industrial Hygienists (ACGIH).

2.3.4 American Society of Mechanical Engineers (ASME) standards.

2.3.5 Compressed Gas Association (CGA) standards.

## 3.0. ROLES and RESPONSIBILITIES

### 3.1 Overview

The chain of responsibility for ensuring that there is a safe work environment at DFRC that follows required safety standards, regulations, codes, and guidelines starts with the Center Director and flows downward through management and supervisors. In addition, each person who works at DFRC must understand that a "condition of employment" is to observe all safety specifications applicable to the task being performed.

### 3.2 Directorates and Single Letter Offices

Are responsible for ensuring that shops within their area of responsibility follow appropriate safety procedures.

### 3.3 Safety, Health, and Environmental Office

The Chief, Safety, Health and Environment Office has oversight responsibility for DFRC shop safety and incurs the following responsibilities:

- Develop and maintain a shop safety program for DFRC.
- Evaluate each shop's safety program as part of safety inspections.
- Investigate shop accidents and incidents and report findings to DFRC management and required agencies. Follow instructions in NPD 8621.1G, NASA Mishap Reporting and Investigation Policy as appropriate.

### 3.4 Shop Supervisors

Shop Supervisors responsibilities include providing and maintaining a safe and healthful work environment. Shop Supervisors will ensure that safety procedures are developed and followed. To accomplish this the Shop Supervisor, as a minimum will:

- Ensure that workers are adequately trained to accomplish their tasks. New employees and those transferred from other locations will receive indoctrination in the Standard Operating Procedures (SOPs) of the shop.
- Ensure safe shop practices are followed.
- Encourage workers to report unsafe conditions and practices and take corrective immediately.
- Enforce good housekeeping.
- Provide workers with proper equipment including personal protective equipment and ensure they are trained to use it.
- Support safety and health personnel in developing a safe and healthful work area.

### 3.5 Employees

Each employee, as a condition of employment, is responsible for following all safety rules, regulations, and practices. Each shop employee will:

- Begin a shop task only when knowledgeable of the proper safety procedures required to accomplish the task.

ALL DOCUMENTS ON THIS SITE  
<http://www.dfrc.nasa.gov/DMS/dms.html>  
ARE FOR REFERENCE ONLY  
THIS SITE IS UPDATED EVERY 30 DAYS

- Notify the Shop Supervisor of any unsafe condition or practice.
- Use personal protective equipment when required.

#### 4.0 BASIC SHOP SAFETY RULES

Accidents occur when unsafe work conditions or practices exist. The operation of a safe shop rests primarily on good judgement, common sense, and the practice of following safety guidelines and procedures. Each shop activity should be looked at as a specific task and evaluated for the hazards it presents and, if deemed necessary, a safety analysis conducted and procedures written for it.

##### 4.1 General Shop Rules

- 4.1.1 Shop employees must be knowledgeable of and comply with appropriate safety procedures.
- 4.1.2 Equipment will only be operated by trained and qualified employees. Equipment will not be borrowed or used by persons whose qualifications are unknown by the Shop Supervisor.
- 4.1.3 Employees will seek assistance with tasks when they are unsure of the safety procedures required by the task.
- 4.1.4 Employees are encouraged and expected to report any hazardous condition or procedure. A verbal notification to the Shop Supervisor generally suffices, however, if a more formal notification is indicated a Report of Hazard/Unsafe Working Conditions, DFRC Form S-2, will be sent to the Safety Office. For immediate notification contact the Safety Office.
- 4.1.5 Non-injury accidents and near misses will be reported to the Shop Supervisor immediately. Injury accidents and imminently dangerous situations will be reported by use of the 911 emergency telephone system.
- 4.1.6 Barrier tape or barricades will be used to identify and isolate hazardous tasks such as those requiring the use of hazardous materials.  
persons may not enter a posted area without approval from the Supervisor.
- 4.1.7 Equipment will not be operated until all required safety devices such as guards, switches, deflection shields, etc., are in place and functional.

Unauthorized  
Shop

- 4.1.8 Alterations or major repairs to shop safety equipment such as guards, shields, safety switches, warning device, etc., will not be made unless authorized by the Shop Supervisor and approved by the Safety Office. Any damaged or inoperable safety equipment or warning devices will be reported to the Shop Supervisor immediately and the equipment will be removed from service until repaired.
- 4.1.9 Equipment in shops will be located in such a manner that one piece of equipment will not pose a hazard to another. Stationary and portable equipment will not be used in a manner that poses a hazard to operations near-by. Portable tools will be stored in a safe manner to preclude a safety hazard or damage.
- 4.1.10 Good housekeeping is essential to shop safety. All debris will be cleaned up following a task completion. Containers with shop debris will be emptied each work period and will not remain in the building over night. Compressed air will not be used for cleaning unless pressures are less than 30 psi, chip guards are in place, and necessary protective gear is worn. Metal chips will not be vacuumed up.
- 4.1.11 Shop Supervisors will ensure that shop personnel are familiar with procedures in DCP-S-021: Bloodborne Pathogens.
- 4.1.12 Shop floors will be kept clean. Any substance that causes the floor to become slippery will be cleaned up or barricaded immediately .
- 4.1.13 Clean-up procedures found in:  
1) DCP-S-038: Hazard Communication;  
2) NASA - Dryden Chemical Management Handbook;  
3) 29 CFR 1910.120: Hazardous Waste Operations and Emergency Response: will be used for guidance in controlling spills and releases of hazardous materials. If a hazardous material spill or release is beyond the capability of shop personnel to control, the 911 emergency telephone system will be used to notify appropriate response personnel.
- 4.1.14 Equipment will not be left running unattended unless it is designed to do so.
- 4.1.15 Equipment operators will not wear jewelry, loose fitting clothes, gloves, neckties, or other apparel that could become entangled in the moving parts of machinery. When working in close proximity to rotating parts hair will be kept under a hat or contained in such a manner to preclude entanglement.

- 4.1.16 Appropriate Personal Protection Equipment (PPE) will be worn. Persons required to use PPE will be trained in its use.
- 4.1.17 Manual gauging of work will not be done while the stock is rotating unless a procedure for doing so has been approved.
- 4.1.18 Procedures in DCP-S-025: Lockout/tagout, will be followed before equipment that uses an energy source is repaired or modified.
- 4.1.19 Aisles and walkways shall be of proper width and clearly marked. Aisles, passageways, corridors, fire lanes, and emergency equipment will not be blocked.
- 4.1.20 Practical jokes and horseplay will not be tolerated in a shop environment.
- 4.1.21 Careful attention will be taken to avoid over pressurizing drums or vessels. Pressurization of drums and vessels will be done with the supervisor's knowledge. The Safety Office will be contacted for any questions regarding the pressurization of drums or vessels. See Section 7.0, UNFIRED PRESSURE VESSELS.
- 4.1.22 Operators of lifting equipment such as fork lifts, cranes, overhead cranes, manlifts, and scissors lifts shall be certified. When lifting equipment is used the operator will assure the load is secure and that, if required, ropes, cables and slings are in place, secured, and not damaged. Traffic will be directed away from the lift area and an adequate number of persons will be available to direct and assist with the lift.
- 4.1.23 Walking or working under suspended loads such as those on forklifts, cranes, ladders, stands, etc., is prohibited.
- 4.1.24 Personnel will follow proper ergonomic procedures when lifting. Lifting loads beyond one's ability will not be attempted. Heavy or bulky loads will be lifted and transported with dollies, hoists, and shop lifts instead of being lifted manually whenever possible.
- 4.1.25 Approved containers will be used, when needed, to protect equipment and material that are being moved or transported.

## 5.0 HAND and PORTABLE POWERED TOOL (See 29 CFR 1910 Subpart P)

### 5.1 Hand Tool Safety Rules

ALL DOCUMENTS ON THIS SITE  
<http://www.dfrc.nasa.gov/DMS/dms.html>  
ARE FOR REFERENCE ONLY  
THIS SITE IS UPDATED EVERY 30 DAYS

- |      |  |
|------|--|
| will | <ul style="list-style-type: none"><li>• Only tools that are approved for the task will be used. Makeshift tools not be used unless approved of by the shop supervisor.</li><li>• Tools will be kept in good condition. Damaged tools will be repaired or discarded.</li><li>• Flattened heads on chisels, punches, hammer, etc. will be re-shaped to avoid chipping thus causing flying particles.</li></ul> |
| not  | <ul style="list-style-type: none"><li>• Tools will be cleaned and stored in designated storage containers when in use.</li><li>• Shop tools will not be loaned or used by anyone who is not associated with the particular shop without approval of the Shop Supervisor.</li><li>• Appropriate PPE will be worn when using hand tools.</li></ul>   |

## 5.2 Portable Power Tool Safety

### 5.2.1 General Safety Rules:

- Do not carry the tool by the cord or hose.
- Do not yank the cord or hose to disconnect it from its receptacle.
- Keep cords and hoses away from heat, oil, and sharp objects.
- Avoid accidental start-up. Disconnect tools from power source when not in use and before servicing or changing accessories such as blades or bits.
- Free hands by securing work with clamps, vise, etc.
- Keep tools in good working condition and never use damaged tools.
- Wear proper apparel and use appropriate PPE.

### 5.2.2 Powered Abrasive Wheel Tools

These tools pose a special safety hazard if not used and checked properly. Some safety cautions are:

- Ensure the wheel or disc is the proper size for the tool.
- Before using inspect the wheel or disc for cracks or other damage.
- During start up, stand to the side to avoid flying particles.
- Ensure all safety guards are in place.
- Never clamp a hand-held power tool down such as in a vise.
- Wear eye protection and other appropriate PPE.

### 5.2.3 Torque Wrench Procedures

- A calibrated torque wrench will be used when torque values are required. Torque procedures will be followed exactly. A steady pull on the torque wrench will be used, avoid jerking the torque wrench in an effort to obtain a desired value.
- Torque wrench extenders cause false readings and will not be used without a conversion table.
- Torquing procedures include determining whether the fastener is to be clean & dry, lubricated, or requires the use of an anti-seize or locking compound. Torque value may not be met if correct procedures are not used.

### 5.2.4 Pneumatic Tools

Precautions when operating pneumatic tools:

- Be careful of getting hit by the tool's attachment or the fastener being worked on. Never point a pneumatic tool toward someone and do not "dead-end" it by pressing the tool onto your body. Use screens to protect nearby workers when necessary.
- Be careful of getting flying debris in the eyes. Always use eye protection with these tools.

### 5.2.5 Powder Actuated Tools

Operators of powder-actuated tools will complete a training course and be certified by Flight Assurance. All safety precautions applicable to powder-actuated tools will be strictly followed when used on the DFRC

site. See 29 CFR 1910.243 (d) and ANSI A10.3: Explosive-Actuated Fastening Tools, which is incorporated by reference (authoritative).

#### 5.2.6 Hydraulic Power Tools

Hydraulic fluid will be fire-resistant and the manufacturer's recommended safe operation pressure for hoses and equipment shall not be exceeded.

#### 5.3 Safety Switches

- Examples of hand held power tools that require a momentary contact "on-off" switch are: drills, tappers, fastener drivers, horizontal, vertical and angle grinders with wheels less than 2 inches in diameter, disc and belt sanders, reciprocating saws, saber saws and similar tools.
- Examples of hand held power tools that may only require a positive "on-off" switch are: platen sanders, disc sanders and grinders with discs or wheels 2 inches or less in diameter, planers, laminated trimmers, nibblers, shears.
- Example of hand held power tools that require constant pressure switches are: circular saws with blades greater than 2 inches in diameter, chain saws, percussion tools.

#### 5.4 Jacks

Jacks will:

- Have an up-limit stop.
- Be used within manufacturer's recommended load limits with the load limit marked on the jack.
- Not be used to hold lifted loads. Lifted loads will be blocked up.
- Be placed on a firm level surface and correctly centered before use.
- Lift from the jack head that is on a level point with the lifting force being applied evenly.
- Be inspected before each use.

## 5.5 Ladders

Ladders present a definite safety hazard when not used correctly. Shop Supervisors will ensure that persons using ladders are trained and follow ladder safety rules. Ladders will be used, inspected, and stored, in accordance with the following guidelines:

- Heavy loads or loads that could cause a person to become unbalanced will not be carried when ascending or descending ladders. Lifting devices, rope and bucket, etc., will be used to raise and lower items. Both hands will be free, one step will be taken at a time, and always face the ladder when ascending or descending.
- Metal ladders are not recommended for use at DFRC. Any existing metal ladders will not be used near electrical sources and will have a warning label like or similar to:

WARNING  
DO NOT USE NEAR  
ELECTRICAL EQUIPMENT

- Wooden ladders will not be painted.
- Defective ladders will be discarded. Repairs are not permitted.
- Ladders will be set on solid, level, and non-moving footings and also leaned against a stable unmoving backing.
- Extra care to secure ladders will be taken in windy conditions.
- Do not set a ladder in front of a door that could open into it.
- The proper type ladder for the task will be used.
- Ladders will not be ascended further than 3 rungs from the top. The top of a step ladder will never be used as a step.
- Makeshift devices will not be use in place of ladders.

See the following directives and guidelines for further information for the proper use and care of ladders.

29 CFR 1910.25; Portable wood ladders.  
29 CFR 1910.26; Portable metal ladders.  
29 CFR 1910.27; Fixed ladders.  
ANSI A14.1 to A14.5; General ladder safety.  
Manufacturer's Instructions.

## 6.0 MACHINERY and MACHINE GUARDING (See 29 CFR 1910 Subpart O)

### 6.1 General Machine Guarding Requirement For All Machines

- point
- One or more methods of machine guarding shall be provided to protect employees in the machine area from hazards such as those created by of operation, nip points, rotating parts, flying chips and sparks.
  - Guards shall be affixed to the machine where possible and secured elsewhere if unable to be connected to the machine itself.
  - A machine guard may not create an added hazard.
  - The "point of operation" of machines whose operation exposes an employee to injury shall be guarded. Examples of machines requiring point of operation guarding are:  
  
Guillotine cutters  
Shears  
Alligator shears  
Power presses  
Milling machines  
Power saws  
Jointers
  - Revolving drums, barrels and containers shall be guarded by an enclosure which is interlocked with the drive mechanism.
  - Fan blades less than 7 feet from the floor will have a screen guard with opening no greater than 1/2 inch.

ALL DOCUMENTS ON THIS SITE  
<http://www.dfrc.nasa.gov/DMS/dms.html>  
ARE FOR REFERENCE ONLY  
THIS SITE IS UPDATED EVERY 30 DAYS

- Fixed machines will be anchored to prevent walking or moving.

## 6.2 Specific Machine Guarding Requirements

it The magnitude of printed material regarding specific machine guarding prevents from being incorporated into this DCP. Definitions and specific information may be obtained from the following documents.

- 29 CFR 1910.211: Definitions.
- 29 CFR 1910.213: Woodworking machinery requirements.
- 29 CFR 1910.215: Abrasive wheel machinery
- 29 CFR 1910.217: Mechanical power presses
- Manufacturer's instructions

Any questions regarding machine guarding will be resolved before the machine is operated.

## 7.0 UNFIRED PRESSURE VESSELS

Unfired pressure vessels that are common in shops include portable and stationary air compressors, compressor units found on various systems such as on air conditioners, vacuum systems, flexible air hose, pipes, pressurized liquid systems, cryogenic systems, hydraulic systems, and certain welding units. These pressure units contain stored energy and, therefore, create a potential hazard to surrounding people and the environment. For application, exclusions, and references on the proper use, inspection, certification, and training required to operate these systems see DCP-S-030 Pressure Systems.

## 8.0 WELDING (See 29 CFR 1910 Subpart Q)

### 8.1 Welding, Cutting, and Brazing Permits

Welding, cutting, and brazing will not be conducted without a Welding, Cutting and Brazing permit (AF Form 592). These "burn permits" are issued by the Safety Office.

### 8.2 Welding Safety

- The Safety Office will inspect unfired pressure vessels or containers that may have held hazardous or explosive materials to ensure pressures are released, hazardous chemicals or materials have been removed, and approve the welding operation before welding may begin.

- An appropriate class fire extinguisher will be available near each welding job.
- Adequate ventilation will be maintained during welding operations to reduce build-up of toxic fumes and vapors.
- Direct rays from arc welding can damage the eyes, therefore, exposure to these rays will be avoided. Both the welder and assistant/s will wear arc welding hoods and it is recommended that they wear clear safety glasses under the hood to protect the eyes from slag when the hood is removed.
- The area around the arc welding site will be screened off to protect persons in the vicinity from receiving eye injuries.
- Welding areas will be barricaded or roped off when welding is being conducted.

### 8.3 Welding Health Hazards

Materials that can cause health hazards when heated or are the product of welding include:

- |                |                                    |
|----------------|------------------------------------|
| • Zinc         | • Cadmium                          |
| • Beryllium    | • Iron Oxide                       |
| • Mercury      | • Lead                             |
| • Fluorides    | • Chlorinated Hydrocarbon Solvents |
| • Phosgene Gas | • Nitrogen Oxides                  |
| • Ozone        | • Acetylene                        |

### 8.4 Physical Hazards

Physical Hazards may include:

- |                         |  |
|-------------------------|--|
| • Compressed Gasses     | • Ruptured Pressure Hoses, Gages, etc. |
| • Ultraviolet Radiation | • Infrared Radiation                   |
| • Intense Visible Light | • Fire/Explosive                       |

## 9.0 CARPENTRY

### 9.1 General Carpentry Rules.

Carpentry tools pose a special hazard when not used properly. Some common accidents that occur in carpentry include dismemberment of fingers, cuts, eye injury, and blunt trauma injuries.

### 9.2 Carpentry Tools

- Personnel will be familiar with safety procedures for machinery and tools that they are required to use.
- Ensure that correct tools are used to accomplish the task.
- Keep tools in good working condition.
- Equipment will not be used unless all required safety devices are installed and functional. Safety devices may include kick-back guards for circular cutters. saws, shields, emergency shut-off switches, etc.
- Pusher sticks will be used to feed material through power saws and  
Care will be taken not to jam stock thus causing “kick-backs.”
- Power nailers will not be pointed toward people but will be pointed downward or in a safe direction until put into use.
- Power tools will not be left running unattended unless designed and approved to do so.
- Stock will be inspected for hazards such as embedded nails and defects before power tools are used on it.

## 10.0 PLUMBING

### 10.1 General Plumbing Rules

- Plumbing tasks in spaces where entry and exiting are difficult or where hazardous may exist or be caused by the plumbing operation will follow confined space procedures. See DCP-S-022: Confined Space.

ALL DOCUMENTS ON THIS SITE  
<http://www.dfrc.nasa.gov/DMS/dms.html>  
ARE FOR REFERENCE ONLY  
THIS SITE IS UPDATED EVERY 30 DAYS

- Personnel from the Safety Office shall inspect pipes and vessels which contain or may have contained hazardous or explosive materials to ensure they are safe before plumbing activity is allowed on them.
- Pipes or pressure vessels containing hot materials will be allowed to cool and pressures released before plumbing activity is allowed on them.
- Extensions will not be used on plumbing wrenches.
- The teeth on pipe wrenches and other grasping tools will be kept sharp. To prevent injury plumbing wrenches should be pulled instead of pushed.
- A Welding, Cutting and Brazing permit, AF Form 592, will be obtained from the Safety Office when torches are used in plumbing operations such as for brazing or “sweating” copper joints.

## 11.0 PAINTING

When DFRC personnel use spray booth they will follow the safety rules required by 29 CFR 1910.107, Spray finishing using flammable and combustible materials and NFPA 33, Spray Applications Using Flammable or Combustible Materials. When using the Edwards Air Force spray booth Air Force directives will also be followed.

### 11.1 General Painting Procedures

- Local exhaust hoods will be used in every instance possible when toxic, environmentally damaging, or flammable spray paints or similar materials are used to paint, cover, or clean items.
- Paint thinners and solvents will be stored in approved storage containers.
- Approved metal waste cans shall be provided wherever rags or wastes are impregnated with finishing materials. The contents of these waste cans shall be disposed of when full and at the end of each shift.
- An approved respirator, when required by the Material Safety Data Sheet (MSDS), will be used for paint or others materials being sprayed.
- Confined Space procedures will be followed when painting in an area designated as a confined space, or if due to painting operation, the space

becomes a permit required confined space. See DCP-S-022; Confined Space.

- Paints shall be used in accordance with its MSDS and manufacturers recommendations. The MSDS for the paint to be used will be on file and reviewed before painting operations begin.

## 12.0 VENTILATION

Shop activities can cause various types of fumes, gasses, abrasive materials and dust, therefore, adequate shop ventilation is essential.

### 12.1 Ventilation Requirements

Whenever dry grinding, dry polishing, buffing, or other operations are conducted that cause hazardous material to be released and employee exposure, without regard to the use of respirator or respiratory protection, exceeds the permissible exposure limits prescribed in 29 CFR 1910.1000 a local exhaust ventilation system shall be provided and used to maintain employee exposures within prescribed limits.

### 12.2 Ventilation Systems

The construction, installation, inspection and maintenance of exhaust systems shall conform to the principles and requirements of ANSI Z9.2; Design and Operation of Local Exhaust Systems. Guidelines established in American Conference of Governmental Industrial Hygienist (ACGHI), Industrial Ventilation and National Fire Codes (NFC) may also be used.

## 13.0 PERSONAL SAFETY

### 13.1 Reduced Ability

Reduced ability caused by an illness can jeopardize the safety of the worker as well as others, therefore, shop personnel will not operate shop equipment when ill if the illness could cause or potentially cause reduced ability

### 13.2 Medication

Medications, either prescription or non-prescription, that have potential adverse side effects will not be used by shop personnel unless approved by a health professional at the Health Unit. Such medications can cause impairment of thought processes, reduced reaction time and, therefore, increase the possibility of an accident.

### 13.3 Intoxicants

The possession of alcoholic beverages, narcotics, and illegal substances is strictly prohibited on the DFRC site. Employees shall not report to work under the influence of intoxicants.

### 13.4 Hygiene

Volatile, irritating, or flammable chemicals such as gasoline, kerosene, paint thinners, etc. will not be used to clean the skin.

## 14.0 PERSONAL PROTECTION EQUIPMENT (PPE)

PPE will be used where required and will be a consideration in every safety analysis.

### 14.1 Protective Headwear - will be worn when:

- There is a danger of bumping one's head.
  - There is a danger of falling objects.
  - There is a possibility of contacting an electrical source with the head.
- Non-conducting headwear (hard-hats) will be worn in this situation.

Protective headwear requires special attention. Hard hats, or helmets must be maintained, sanitized, stored properly, and inspected regularly. For specific information on maintaining protective headwear see ANSI Z89.1; Industrial Workers Protective Headwear.

### 14.2 Eye Protection

14.2.1 Contact lenses: will not be worn in shop environments where debris such as dust, chips, particles, chemicals, toxic fumes or vapors could be trapped behind the lens or be absorbed by soft lenses. In these environments prescription safety glasses that meet OSHA specifications will be worn in place of contact lenses. Full face shields are recommended when there is a possibility of flying particles, however, approved eye protection will be used in every case. See 29 CFR 196.133 Eye and face protection, and ANSI Z87.1; Occupational and Educational Eye and Face Protection.

14.2.2 Warning signs: “Eye Protection Required” warning signs will be posted in conspicuous location to warn person of potential eye hazards where such hazards exist. Supervisors of eye protection required areas will ensure that all exposed personnel, including visitors, comply with eye protection requirements.

### 14.3 Hearing Protection

It is NASA’s policy to engineer out excessive work place noise where possible. To “engineer out” means that equipment that produces problem noise will be located away from work areas, isolated with noise abatement material, or engineered in other ways to reduce noise output. If excessive noise cannot be engineered out other protective methods must be used. A noise level of 82 dBA for an 8-hour time weighted average, without regard to noise attenuation, is the trigger that places individuals into the DFRC Hearing Conservation Program. The DFRC Hearing Conservation Program requires persons who are exposed to the noise “trigger”, stated above, will receive a yearly audiogram and an annual hearing awareness training session both provided by the Health Unit.

DFRC uses ACGIH TLVs<sup>®</sup> for hearing exposure limits.

Duration per Day	Sound Level dBA Slow Response
8 Hr.	85
4 Hr.	88
2 Hr.	91
1 Hr.	94
30 Min.	97
15 Min.	100

Employees who believe they are exposed to levels greater than those listed above shall contact the Industrial Hygienist at the Safety Office for a noise survey and evaluation. See DCP-S-037 Hearing Conservation Program for details.

### 14.4 Respiratory Protection

- Person/s who need respiratory equipment will first make an appointment at the DFRC Health Unit for a medical evaluation then schedule a training class and fit test with the DFRC Industrial Hygienist.
- Contact lenses will not be worn under a full face respirator.

ALL DOCUMENTS ON THIS SITE  
<http://www.dfrc.nasa.gov/DMS/dms.html>  
ARE FOR REFERENCE ONLY  
THIS SITE IS UPDATED EVERY 30 DAYS

#### 14.5 Safety Footwear

Appropriate safety footwear for the task and work area will be worn. Example; steel toed shoes are a requirement at DFRC for shops and hangars. Other footwear needs may include hot, corrosive, wet, or toxic substances as well as for protection from falling objects. Damaged footwear that could cause trips, slips, falls or foot injuries will be discarded. See ANSI Z41; Personal Protective Footwear for specific footwear requirements.

### 15.0. TRAINING

#### 15.1 Training Requirements

Shop Supervisors shall ensure that employees receive required training before operating shop equipment. Training may be required by OSHA, NASA, manufacture's requirements or recommendations, or as a result of findings from shop safety analysis. Depending on the particular shop, safety training may include:

- |                                 |                                 |
|---------------------------------|---------------------------------|
| • high pressure air             | • confined space                |
| • hydraulics                    | • hazard communication          |
| • lifting devices               | • cryogenics                    |
| • personal protective equipment | • equipment manufacture's       |
| • machine guarding              | • electrical safety             |
| • lockout/tagout                | • bloodborne pathogens          |
| • ionizing radiation safety     | • non-ionizing radiation safety |
| • laboratory safety (chemical)  | • pressure systems              |
| • respiratory protection        | • explosive safety              |
| • fire protection               | • hearing conservation          |
| • ergonomics                    | • vehicle safety                |

#### 15.2 Training Records

Employee's training records will be maintained by his/her supervisor or in a central location where the records are accessible to the supervisor, employee and safety inspectors. Training records will be maintained for (5) years after the employee terminates or ceases to use the training. (See NPD 1441.1, Record Retention Schedule 3; 33 [3400] N 15-38, G Technical Training.) On-site contractors are responsible for maintain training records for their employees.